



CR Clean Air

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AIR POLLUTION CONTROL

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MEETING THE CHALLENGE

The California site of the TRW Strategic Defense Initiative (SDI) laser project is one of the world's largest vacuum and air pollution control installations. Ejectors manufactured by CRClean Air simulate the atmosphere of space for the testing of a hydrogen/fluorine laser. Gases produced during laser generation are removed by a CRClean Air custom-designed Packed Tower Scrubber.

For over 50 years now, CRClean Air has provided solutions to those faced with the challenge of efficient resource utilization and the responsibility for meeting stringent emission standards.

Current and proposed regulations call for swift compliance, while the recovery and reuse of valuable process vapor has become standard operating procedure throughout the world.

Regardless of the air pollutant or industrial source, CRClean Air has the engineering know-how and application experience to design and manufacture a system to meet the most demanding performance requirements.

For further information, visit www.crcleanair.com

SYSTEM DESIGN

CRClean Air offers a full range of air pollution control technologies. Our engineers are prepared to analyze your requirements and engineer a solution for virtually any application. From a single-stage, stand alone unit to an automated, multi-stage system complete with state-of-the-art instrumentation and programmable logic controllers, CRClean Air's team of chemical, mechanical and electrical engineers will work together to meet your performance needs.

We specialize in the design of High Energy Venturi Scrubbers, Jet Venturi Scrubbers and Packed Towers. Our strength lies in our ability to integrate these products into a solution tailored to meet the most exacting requirements.

SOLVING PROBLEMS OTHERS WON'T TOUCH

Years of research and innovative engineering experience have earned CRClean Air a reputation for resolving the most difficult challenges. We have handled a wide variety of toxic, hazardous, common, and uncommon gases, including: HCl, HF, HBr, H₂S, SO₂, NH₃, Cl₂, Alcohols, Silicon Dioxide, Silicon, Tetrachloride, Fine Oil Mist, Boron, Trifluoride, Organic Anhydrides, Sulfuric Acid Mist, Lime Dust, Phosgene, ethylene oxidel propylene, oxide, and VOCs, to name a few!

SPECIALIZED APPLICATIONS

EtO/PO Scrubbers

Ethylene Oxide gas (EtO) is used to reduce or render inactive microbial populations in sterilization processes. Propylene Oxide (PO) and Ethylene Oxide are also utilized as precursors in the production of a number of critical chemicals.

CRClean Air's proprietary EtO/PO scrubbing systems utilize absorption and hydrolysis of these oxides to glycols to effectively treat EtO and PO contaminated gases. Efficiencies greater than 99.99% can be guaranteed. Fully automated systems are available.

NO_x Scrubbers

Conventional scrubbers are limited to low NO_x removal efficiencies due to the nature of the aqueous absorption chemistry involved. CRClean Air's patented "Surface Active" media effectively overcomes those limitations –without the need for exotic or expensive chemicals or a costly and complex operational scheme. This technology is particularly well suited for applications where the infamous "orange" plume is produced by high levels of NO₂.



AIR POLLUTION CONTROL SYSTEMS

WET SCRUBBERS

CRClean Air's Jet-Venturi Scrubber is one of the most economical answers to the growing problem of air pollution. It is an efficient means for minimizing smoke and undesirable odors, cleaning and purifying air and other gases as well as reclaiming valuable product which may be exhausted to the atmosphere. It can also be used as a concentrator by having the motivating fluid adsorb the fume for recirculation until a desired concentration is reached. And the Fume Scrubber can do all this with a minimum of maintenance since there are no moving parts and because it operates at low velocities.

PACKED TOWER SCRUBBER

CRClean Air's Packed Tower Scrubber utilizes a vertical countercurrent design for highly efficient absorption of a variety of toxic gases. In addition to its extensive use in air pollution control, the Packed Tower can serve as a gas/liquid contactor in a number of process applications. Efficiencies of 99.99% and greater are not unusual for many scrubbing applications. During operation, gas flows upward through a packed bed while scrubbing liquid flows down (by gravity) over the packing material. The counter-flow design principle offers optimal mass transfer. CRClean Air supplies cross flow and co-current flow Packed Tower designs as well.

HIGH ENERGY VENTURI SCRUBBER

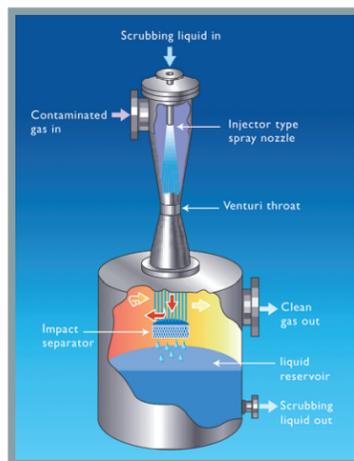
The High Energy Venturi Scrubber is ideally suited to the capture of small particles less than 3 microns in size. It is effective as well in the submicron range and requires little or no maintenance.

For applications where variations in gas flow require throat gas velocity compensation to maintain specified scrubbing efficiencies, CRClean Air offers automatic and manually variable throat designs. The automatic throat is used where flow conditions vary widely and frequent

adjustments are required. When occasional variations occur, a manually-controlled throat is available.

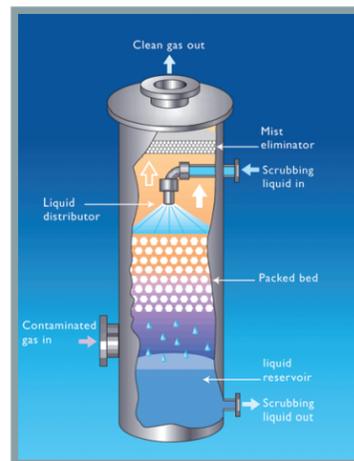
JET VENTURI SCRUBBER

The Jet Venturi Scrubber utilizes a liquid motivated ejector design to entrain contaminated gases, generally without the need for a blower. The relatively high liquid-to-gas ratio, liquid atomization, and open internal design provide effective scrubbing of heavily contaminated gases with minimal maintenance and virtually unlimited turndown capabilities. Its ability to handle wide ranging conditions makes the Jet Venturi one of the most flexible designs available. It is often used as a first stage in a multi-stage air pollution control system.



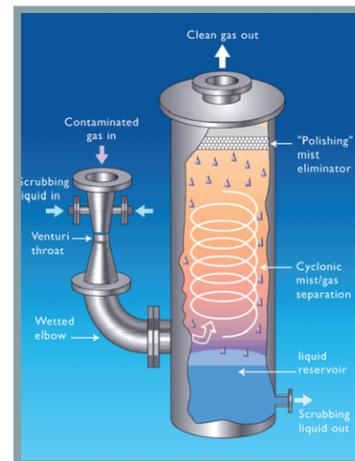
JET VENTURI SCRUBBER

Motivating fluid exits the nozzle in a hollow cone spray pattern, creating a draft. Contact between the scrubbing liquid and the gas results in high gas mass transfer and/or particulate capture. This mixture discharges into a CRClean Air designed separator.



PACKED TOWER SCRUBBER

Utilizing the most modern packing designs to provide contact between gas and liquid streams, the Packed Tower Scrubber achieves the extremely low toxic gas discharge limits required to meet emission standards.



HIGH ENERGY VENTURI SCRUBBER

Energy from a high-velocity, dust laden gas stream is used to atomize a liquid stream. Cyclonic gas flow in the separator drives the dust laden liquid to the outside wall. The liquid is collected and returned to the sump.

CASE STUDY

Systems Work Together for HCl Removal and Recovery

A specialty chemical manufacturer was looking for a way to remove HCl from its off-gas before it was discharged to the atmosphere. CRClean Air designed and manufactured a system which uses two Jet Venturi Fume Scrubbers in series, followed by two Packed Towers in series. Intimate mixing of the gas stream and scrubbing liquid allows the Jet Venturi Scrubbers to remove 98% of the HCl and the Packed Towers to remove the remainder. The Jet Venturi Scrubbers collect 98% of the HCl while creating a marketable aqueous HCl solution. The Packed Towers recirculate the diluted NaOH solution, and “polish” the gas stream to meet low HCl discharge limits. The units have proved to be virtually maintenance free, with final emissions concentrations of approximately 2 PPM. Liquid waste production is minimal and the recovery of marketable HCl has offset the cost of the system.

CR Clean --- Air

PROVIDING WORLDWIDE SOLUTIONS

Our Air Pollution Control technology continues to offer a powerful design and engineering advantage. Call us for the office location of the factory-trained air pollution control specialist nearest you.

Simply call **+1 (973) 947-8787**

Or email Nick

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For further information, visit

www.crcleanair.com